

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of)	MAIL STOP
Raimo Leimala)	APPEAL BRIEF - PATENTS
Application No.: 10/511,290)	Group Art Unit: 1793
Filed: October 14, 2004)	Examiner: Jie Yang
For: METHOD FOR THE)	Appeal No.: _____
PURIFICATION OF COPPER)	
CHLORIDE SOLUTION)	
)	
)	

APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This appeal is from the decision of the Primary Examiner dated June 9, 2010 finally rejecting claims 1-5, 8-13, and 15, which are reproduced as the Claims Appendix of this brief.

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The Commissioner is hereby authorized to charge any appropriate fees under 37 C.F.R. §§1.16, 1.17, and 1.21 that may be required by this paper, and to credit any overpayment, to Deposit Account No. 02-4800.

I. Real Party in Interest

The present application is assigned to Outotec OYJ, which is the real party in interest in this application.

II. Related Appeals and Interferences

Neither the Appellant's legal representatives, or the assignee, knows of any other appeal or interferences which will affect or be directly affected by or have bearing on the Board's decision in the pending appeal.

III. Status of Claims

Claims 1-5, 8-13, and 15 are pending in this application. Claims 6, 7, and 14 have been cancelled without prejudice to, or disclaimer of, their subject matter. Each of claims 1-5, 8-13, and 15 has been finally rejected by the Office, which final rejection is appealed herein.

IV. Status of Amendments

No amendments were submitted after final rejection. A Notice of Appeal was submitted on August 2, 2010.

V. Summary Claimed Subject Matter

Claim 1 relates to a method for removing metal impurities during a chloride-based copper recovery process. The method involves taking an aqueous strong chloride solution which has an acidic or neutral pH and an alkali chloride content of at least 200 g/l, and which contains monovalent copper and one or more metal

impurities, and contacting this solution with a chelating ion-exchange resin. The contacting takes place under conditions that bind one or more metal impurities to the chelating ion-exchange resin and that do not bind at least some of the monovalent copper to the chelating ion-exchange resin. The result of the contacting is a bound chelating ion-exchange and an aqueous strong chloride solution that contains monovalent copper, but that is depleted of the metal impurities. The resulting solution and the bound chelating ion-exchange resin are then separated.

Claim 1 is supported by the originally filed specification, *inter alia*, at page 3, lines 11-22, and page 4, lines 6-18 and lines 24-26.

Claim 15 relates to a similar method for removing one or more metal impurities in a chloride-based copper recovery process. The method involves contacting an aqueous strong chloride solution having an acidic or neutral pH of at least 6, an alkali chloride content of at least 200 g/l, and a monovalent copper content of 30-100 g/l with the chelating ion-exchange resin. The method steps essentially correspond to those already described for claim 1.

Support for this claim can be found, *inter alia*, in the specification at page 3, lines 11-22, page 4, lines 6-18 and 24-26, and page 5, lines 17-19.

VI. Grounds of Rejection to be Reviewed on Appeal

The issues to be reviewed on appeal are:

- 1) Whether claims 1, 5, 8-12, and 15 were properly rejected under 35 U.S.C. §103(a) as obvious over U.S. Patent No. 6,007,600 (Hyvärinen et al.) in view of U.S. Patent No. Re 36,118 (Cupertino et al.).

2) Whether claims 2-4 and 13 were properly rejected under 35 U.S.C. §103(a) as obvious over Hyvärinen et al. in view of Cupertino et al., and further in view of U.S. Patent No. 6,165,367 (Partridge).

VII. Argument

A. Claims 1, 5, 8-12, and 15 are patentable over Hyvärinen et al. and Cupertino et al.

On page 2 of the Office action dated June 9, 2010, the Office has rejected claims 1, 5, 8-12, and 15 under 35 U.S.C. § 103(a) as obvious over Hyvärinen et al. in view of Cupertino et al. Appellants respectfully submit that this rejection constitutes reversible error for the reasons given below.

1. Claims 1, 5, 8, and 9

With respect to claim 1, the Office has stated:

Regarding claim 1, [Hyvärinen et al.] teaches a method for producing copper in a hydrometallurgical process from copper-bearing raw material. The copper-bearing solution obtained from the leaching is subjected to reducing and solution purification (Abstract of [Hyvärinen et al.]). [Hyvärinen et al.] teaches monovalent copper in a chloride-base solution (Col.2, lines 44-67 of [Hyvärinen et al.]), which reads on [sic] the removal of one or more metal impurities in chloride-base copper recovery process comprising monovalent copper as recited in the instant claim. [Hyvärinen et al.] teaches that impurities of the CuCl-NaCl solution are removed by using known reagents (Col.3, lines 59-63 of [Hyvärinen et al.]).

Office action dated January 25, 2010 at page 3. The Office admits that Hyvärinen et al. is deficient in at least one respect with regard to Appellant's claims, stating:

[Hyvärinen et al.] does not specify apply chelating ion-exchange resin to remove one or more metal impurities. [Cupertino et al.] teaches a method for separating a metal selected from the group of magnesium,

copper, titanium, iron, zinc from an organic complex thereof (Col. 1, lines 8-10 of [Cupertino et al.]).

Office action dated January 25, 2010 at page 3. In an attempt to cure this deficiency, the Office relies on Cupertino et al., stating:

[Cupertino et al.] teaches applying a chelating ring resin to extract the metal from the aqueous solution in the form of a complex of the metal and the extractant (Col.1, lines 11-19, examples 5-6 of [Cupertino et al.], and claims 1-10), which reads on the method of removal impurities by contact an aqueous with a chelating ion-exchange resin and removing the metal impurities from said solution using said chelating ion-exchange resin. [Cupertino et al.] teaches that the compound of organic phase are valuable for the selective extraction of antimony and /or bismuth contaminants from the highly acidic solutions used in copper refining (Col. 3, lines 19-27 of [Cupertino et al.]), which reads on the limitation of the chelating ion exchange resin binding one or more metal impurities and not binding copper in the instant claim.

Office action dated January 25, 2010 at pages 3-4. From this, the Office concludes that Appellant's claimed invention would have been obvious to one having ordinary skill in this art:

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply chelating ion-exchange resin to remove metal impurities as demonstrated by [Cupertino et al.] in the process of [Hyvärinen et al.] because [Cupertino et al.] teaches the method is particularly effective for the recovery of metals include chromium, manganese, cobalt and copper (Col. 4, lines 60-66 of [Cupertino et al.]).

Office action dated January 25, 2010 at page 4.

More particularly, the Office asserts that it would have been obvious to use the chelating ion-exchange resin of Cupertino et al. to remove "metal impurities" in "the process of" Hyvärinen et al. What the Office fails to explain is what these metal

impurities are. Hyvärinen et al., at column 3, lines 54-63 (the portion cited by the Office) does not identify them. The Office also fails to explain how it knows that these unidentified impurities are of a type that is suitable for removal by the ion exchange resin of Cupertino et al., particularly where Hyvärinen et al. suggests that these unidentified impurities can be precipitated out at pH values lower than that corresponding to precipitation of Cu_2O "by means of products obtained from the later stages of the process (i.e. granular copper 8 and sodium hydroxide 13 formed in the chlorine-alkali electrolysis 12." The Office has not explained why, if the impurities have already been removed by precipitation with granular copper and/or sodium hydroxide, it would have been necessary or even desirable to treat the resulting stream with the chelating ion-exchange resin of Cupertino et al. The Office has not even identified any particular impurity that would remain after the treatment specified in Hyvärinen et al., much less an impurity that would remain and be susceptible by treatment with the chelating resin of Cupertino et al. Appellant submits that the Office rationale for combining the reference teachings appears to be based on pure conjecture, rather than on any motivation to solve a particular problem disclosed in the references themselves or by the commercial environment in which these processes are conducted. This is not the appropriate standard for assessing obviousness. See *KSR International Co. v. Teleflex Inc.*, 550 U.S. 398, 82 USPQ2d 1385, 1397 (2007).

Moreover, the Office does not explain where, in either of the references, it is taught or suggested that the use of organic complexes of Cupertino et al. is a suitable replacement for, or addition to, the precipitation techniques already disclosed as suitable by Hyvärinen et al. Moreover, as the Office has demonstrated by its citation to Example 4 of Cupertino et al., the Cupertino et al. disclosure is

primarily devoted to the use of organic extraction solutions to remove metals. The Office has yet to explain why one having ordinary skill in this art would have, in particular, selected the ion exchange resin embodiment of Cupertino et al. for use with the (unspecified) metal contaminants of Hyvärinen et al.

Appellant submits that the Office has not advanced any rationale under 35 U.S.C. § 103(a) that, based upon the facts presented by the Office, would lead one having ordinary skill in this art to recognize a problem with the Hyvärinen et al. process that can or should be solved by turning to Cupertino et al., ignoring the teachings of Cupertino et al. regarding a liquid extraction, selecting the sole teaching regarding an ion-exchange resin, and applying this to the Hyvärinen et al. process with any reasonable expectation of success.

Accordingly, Appellant submits that the Office's rejection constitutes reversible error, and should therefore be reversed.

2. Claim 10

With respect to claim 10, the Office has stated:

[Cupertino et al.] does not specify the [detailed] process for applying NaCl and alkaline solutions. [Hyvärinen et al.] teaches: ". . . a countercurrent leaching of a sulfidic copper material, such as chalcopyritic copper concentrate, in a chloride milieu, so that the obtained product is essentially iron-free alkali chloride-copper chloride solution, where the copper is mainly monovalent . . ." (Col. 2, Line 44-67 and also refer to Fig. 1-3). [Hyvärinen et al.] shows ". . . the leaching is performed into a circulating NaCl solution . . ." (Col. 3, Line 35-46 and refer to Fig. 1-3). [Hyvärinen et al.] also teaches: "The precipitation is carried out by means of sodium hydroxide . . ." (Col. 4, Line 3-19, refer to Fig. 1-3 step 13). [Hyvärinen et al.] teaches the similar hydrometallurgical processes applying on the same copper-contained solution as recited in the instant invention. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to choose suitable NaCl and NaOH treatment in

operation as demonstrated in US '600 in the process of [Cupertino et al.] because [Hyvärinen et al.] teaches the copper by hydrometallurgical chloride processes has the chance to make use of a lower degree of oxidation (Col. 2, Line 33-39 of [Hyvärinen et al.]).

Office action dated June 25, 2008 at page 8 (emphasis added).

Appellant incorporates by reference the arguments made above with respect to claim 1, from which claim 10 depends. Appellant has previously explained that claim 10 relates to the process steps used to elute the absorbed metal impurities from the chelating ion exchange resin used in claim 1, and to regenerate it. As Appellant explains in the specification at page 4, sodium chloride solution is used to displace an alkaline regeneration solution because otherwise stability of the monovalent copper solution can become problematic. Neither of the cited references address this problem with respect to elution from a chelating ion-exchange resin. To the contrary, as indicated in Example 4, Cupertino et al. is concerned with extracting divalent copper in a liquid extraction, not with maintaining monovalent copper in solution during ion-exchange.

3. Claims 11 and 12

Appellant incorporates by reference the arguments made above with respect to claim 1, from which claims 11 and 12 depend.

Claims 11 and 12 relate to the use of hydroxide precipitation to remove the majority of metal impurities from the strong chloride solution of monovalent copper prior to contacting with an ion exchange resin. The precipitation described at column 4, lines 3-19 of Hyvärinen et al. is the precipitation of monovalent copper, not of impurities from the monovalent copper-containing stream. The Office thus cites as a primary reference a reference that does the opposite of what Appellant is claiming, and relies on such a reference to allege that Appellant's claims are unpatentable

without explaining why this difference from the claims would have been obvious. Even if it were proper to combine Hyvärinen et al. and Cupertino et al. (which Appellant does not admit), the result would not be Appellant's invention because there is no disclosure of any monovalent copper in Cupertino to be separated from metal impurities present in the solution. Even if there were such a disclosure, there is no suggestion in either reference to precipitate out any of the metal impurities before treatment with an ion exchange resin. For at least this reason, Appellant respectfully submits that the Office has failed to establish a *prima facie* case of obviousness, and that this rejection should be withdrawn.

4. Claim 15

With respect to claim 15, the Office states:

Regarding claim 15, [Hyvärinen et al.] does not specify the amount of monovalent copper content of 30-100g/l as recited in the instant claim, [Cupertino et al.] teaches an acid strength of up to 0.5 molar above the stoichiometric requirement for stripping the metal the metal whereby said complex is decomposed and metal ions are transferred to the aqueous solution (Claim 1 of [Cupertino et al.], 0.5 molar copper is about 32g/l— noted by examiner, also refer to the example 4 of [Cupertino et al.]).

Office action dated January 25, 2010 at pages 6-7. The Office's reliance on Example 4 of Cupertino et al. does not support the Office's assertions. The aqueous solution of Cupertino et al. contains only 1 g/L of one of the metals, each of which is divalent or trivalent, and uses an organic extraction solution, not an ion exchange resin. The Office has yet to explain what possible relevance the teachings about acid strength provided by this example have to a completely different system for separating a metal impurity from monovalent copper (i.e., from a mixture of two metal ions) using a completely different separation technique (i.e., a chelating ion

exchange resin) as recited in claim 15. Appellant submits that the failure of the Office to provide such an explanation makes clear that there is no *prima facie* case of obviousness, and that this rejection should be reversed.

For these reasons, Appellants respectfully submit that the Office has failed to establish a *prima facie* case of obviousness, and that this rejection should be withdrawn.

B. Claims 2-4 and 13 are patentable over Hyvärinen et al., Cupertino et al., and Partridge

On page 3 of the Office action dated June 9, 2010, the Office has rejected claims 2-4 and 13 under 35 U.S.C. § 103(a) as obvious over Hyvärinen et al. in view of Cupertino et al., and further in view of Partridge. Appellants respectfully submit that this rejection constitutes reversible error for the reasons given below.

With respect to claims 2-4, the Office action states:

Regarding claims 2-4, [Cupertino et al.] teaches that it is known in the arts that the organic complex is produced from an aqueous solution of metal salt with a chelating resin. This point is further evidenced by [Partridge]. [Partridge] teaches a method for selectively removing a heavy metal from an aqueous waste streams and more particularly to methods for reducing the heavy metal content in the waste steam to sub-ppm level (Co1.1, Line 5-9 of [Partridge]). [Partridge] teaches: "...providing a chelating resin containing amino-phosphonic group for capturing the heavy metal ions...."; "...wherein the chelating resin is a styrene divinylbenzene copolymer..." (Claims 1-4 of [Partridge]); [Partridge] teaches the resin' group can be "represented as: -NH-CH₂-P(O₃Na)₂" (Col.2, Line 22-37); and [Partridge] also tests "...a chelating resin with iminodiacetic acid functional group..." (Col.4, Line 38-41). Compared with the instant invention, [Partridge] overlaps the limitations related to chelating ion-exchange resin recited in the instant claims 2-4. The similar hydrometallurgical process to extract heavy impurities with the similar ion exchange resin taught by [Partridge] renders *prima facie* obvious. Therefore, it would have been obvious to one of ordinary skill in the art at the time

the invention was made to choose a suitable ion-exchange resin as demonstrated in [Partridge] in the process of [Hyvärinen et al.] in view of [Cupertino et al.].

Office action dated January 25, 2010 at pages 7-8.

With respect to claim 13 the Office action states:

Regarding claim 13, [Hyvärinen et al.] teaches that the reduced granular or pulverous copper product is further subjected to melting and casting in order to produce commercial-grade copper (Col. 1, lines 17-20 of [Hyvärinen et al.]). [Partridge] teaches "methods for selectively removing a heavy metal from an aqueous waste streams and more particularly to methods for reducing the heavy metal content in the waste steam to sub-ppm level." (Col. 1, Line 5-9, this metal impurity level is compatible with the level that recited by instant invention—refer to the instant claim 12). This means it would have been obvious to one of ordinary skill in the art to get "cathode copper LME-A grade copper" as demonstrated in [Partridge] in the process of [Hyvärinen et al.] in view of [Cupertino et al.].

First, the Office's characterization of Appellant's claimed invention is inaccurate. Appellant's claims are not directed to "removing metal ions from an aqueous solution of metal salt with a chelating agent." Appellant's claims are directed to removing metal impurities from an aqueous strong chloride solution of monovalent copper using an chelating ion exchange resin, while leaving the monovalent copper in the aqueous chloride solution. This is not disclosed or suggested in Hyvärinen et al. or Cupertino et al.

Second, Partridge does not cure the deficiencies of Cupertino et al. noted above. Partridge discloses removing heavy metals, such as uranium, from a waste stream containing complexing anions. However, to the extent that chloride ion is considered such a complexing anion, Partridge only discloses a minor amount (i.e., less than 0.1 M in Example I). Nowhere does Partridge disclose or suggest that a

strong chloride solution of monovalent copper could be purified of metal contaminants by passing the solution over a chelating ion exchange resin without absorption of the monovalent copper ion. Even if it were proper to combine Partridge were combined with Hyvärinen et al. and Cupertino et al. (which Appellant does not admit), the result would not be Appellant's claimed method, but rather a method where all heavy metals are removed (including any monovalent copper) from an aqueous stream containing only minor amounts of chloride ion. This is not the method that Appellant has claimed.

With respect to claim 13, the Office asserts that it would have been obvious to reduce heavy metal content to a sub-ppm level because such a reduction is disclosed by Partridge, and that this somehow makes obvious the feature recited in claim 13 that metal impurities are reduced to a level that corresponds to cathode copper LME-A grade impurity level. What the Office appears to fail to recognize, however, is that the purity level recited in claim 13 is a purity level for copper. In other words, the copper that results from Appellant's claimed process is sufficiently pure that it meets the cathode copper LME-A requirements. This has nothing to do with the reduction of heavy metals in Partridge, however, since Partridge does not disclose any applicability to streams containing copper. Moreover, even if copper were present in a feedstock stream subjected to the process of Partridge, there is nothing in Partridge to suggest that copper would not also be reduced to a sub-ppm level, in which case there would essentially be no copper left in the stream to have its purity evaluated.

The Office has stated:

The motivations for combining these references can refer to [the] office action above. Still regarding argument 3, [Partridge] specifically applies the same chelating resin with aminophosphonic

function group in a strong acid solution (Col. 1, lines 22-38 and Col. 2, lines 3-10 of [Partridge]) as recited in the instant claim, a similar element selectivity would be highly expected, therefore, the process of [Partridge] will not reduce copper to sub-ppm level.

Office action dated July 10, 2009 at page 11. As Appellant has explained above, Appellant does not use a strong acid solution; it is the Office that has incorrectly assumed that the strong chloride solution is a strong acid solution. Accordingly, there is no basis or support for the notion that the process of Partridge would not reduce copper to sub-ppm levels, along with the other impurities being removed by the process disclosed therein.

For the reasons given above, Appellant respectfully submits that the Office's rejection constitutes reversible error, and respectfully request that this erroneous rejection be reversed.

VIII. Claims Appendix

See attached Claims Appendix for a copy of the claims involved in the appeal.

IX. Evidence Appendix

See attached Evidence Appendix for copies of evidence relied upon by Appellant.

X. Related Proceedings Appendix

See attached Related Proceedings Appendix for copies of decisions identified in Section II, supra.

Respectfully submitted,

BUCHANAN INGERSOLL & ROONEY PC

Date October 4, 2010

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Table of Contents

- I. Real Party in Interest
- II. Related Appeals and Interferences
- III. Status of Claims
- IV. Status of Amendments
- V. Summary Claimed Subject Matter
- VI. Grounds of Rejection to be Reviewed on Appeal
- VII. Argument
- VIII. Claims Appendix
- IX. Evidence Appendix
- X. Related Proceedings Appendix

VIII. CLAIMS APPENDIX

The Appealed Claims

1. A method for the removal of one or more metal impurities in chloride-based copper recovery processes, comprising:
 - contacting an aqueous strong chloride solution, having an acidic or neutral pH of at least 6 and an alkali chloride content of at least 200 g/l, and comprising monovalent copper and one or more metal impurities with a chelating ion-exchange resin under conditions that:
 - bind one or more metal impurities to said chelating ion-exchange resin,
 - and
 - do not bind at least some of said monovalent copper to said chelating ion-exchange resin,
 - thereby forming:
 - a bound chelating ion-exchange resin, and
 - a metal impurity depleted aqueous strong chloride solution comprising monovalent copper; and
 - separating said bound chelating ion-exchange resin from said metal impurity depleted aqueous strong chloride solution comprising monovalent copper.
2. A method according to claim 1, wherein the chelating ion-exchange resin has a styrene-divinyl-benzene matrix ring structure.
3. A method according to claim 1, wherein the chelating ion-exchange resin contains an iminodiacetic acid functional group.
4. A method according to claim 1, wherein the chelating ion-exchange resin contains an aminophosphonic functional group.
5. A method according to claim 1, wherein the one or more metal impurities contain zinc, nickel, lead, iron, manganese, or combinations of these.

8. A method according to claim 1, wherein the contacting occurs in an acidic environment.
9. A method according to claim 1, wherein the contacting occurs in a neutral environment.
10. A method according to claim 1, further comprising:
 - displacing a residual metal impurity depleted aqueous strong chloride solution comprising monovalent copper from the bound chelating ion-exchange resin by contacting the bound chelating ion-exchange resin with an NaCl solution;
 - eluting said one or more metal impurities from the bound chelating ion-exchange resin to form an eluted chelating ion-exchange resin;
 - regenerating the eluted chelating ion-exchange resin by contacting it with an alkaline solution; and
 - displacing the alkaline solution from the chelating ion-exchange resin with an NaCl solution before contacting the chelating ion-exchange resin with an aqueous strong chloride solution comprising monovalent copper and one or more metal impurities.
11. A method according to claim 1, further comprising removing the majority of the one or more metal impurities in the strong chloride solution of monovalent copper by hydroxide precipitation prior to the contacting with the chelating ion-exchange resin.
12. A method according to claim 11, wherein the hydroxide precipitation removes said one or more metal impurities to a content of 0.1 - 1 g/l.
13. A method according to claim 1, wherein said one or more metal impurities are removed from said aqueous strong chloride solution comprising monovalent copper and one or more metal impurities to at least a level that corresponds to cathode copper LME-A grade impurity level.

15. A method for the removal of one or more metal impurities in chloride-based copper recovery processes, comprising:

contacting an aqueous strong chloride solution, having an acidic or neutral pH of at least 6 and an alkali chloride content of at least 200 g/l, wherein said aqueous strong chloride solution comprises monovalent copper and one or more metal impurities and has a monovalent copper content of 30 - 100 g/l with a chelating ion-exchange resin under conditions that:

bind one or more metal impurities to said chelating ion-exchange resin,
and

do not bind at least some of said monovalent copper to said chelating ion-exchange resin,

thereby forming:

a bound chelating ion-exchange resin, and

a metal impurity depleted aqueous strong chloride solution comprising monovalent copper; and

separating said bound chelating ion-exchange resin from said metal impurity depleted aqueous strong chloride solution comprising monovalent copper.

IX. EVIDENCE APPENDIX

None

X. RELATED PROCEEDINGS APPENDIX

None